

Name _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

On January 1 of every year, many people watch the Rose Parade on television. The week before the parade is very busy for float builders and decorators. Roses, carnations, and other flowers are purchased from around the world to decorate the floats. Based on past experience, one float decorator found that 10% of the bundles of roses delivered will not open in time for the parade, 20% of the bundles of roses delivered will have bugs on them and be unusable, 60% of the bundles of roses will turn out to be beautiful, and the rest of the bundles of roses delivered will bloom too early and start to discolor before January 1. Conduct a simulation to estimate how many roses the float decorator will need to purchase to have 15 good bundles of roses to place on the float.

1) Describe how you will use a random number table to conduct this simulation. 1) _____

2) State your conclusion. 2) _____

A large manufacturer of batteries knows that, historically, 10% of its batteries come off the production line defective, and the remaining 90% of batteries come off the production line in working condition. Conduct a simulation to estimate how many batteries the company needs to pull off the production line in order to be sure of ending up with 10 working batteries.

3) Describe how you will use a random number table to conduct this simulation. 3) _____

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4) Show three trials by clearly labeling the random number table given below. Specify the outcome for each trial. 4) _____

| | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 37542 | 04805 | 64894 | 74296 | 24805 | 24037 | 20636 | 10402 | 00822 |
| 08422 | 68953 | 19645 | 09303 | 23209 | 02560 | 15953 | 34764 | 35080 |
| 99019 | 02529 | 09376 | 70715 | 38311 | 31165 | 88676 | 74397 | 04436 |
| 12807 | 99970 | 80157 | 36147 | 64032 | 36653 | 98951 | 16877 | 12171 |

For a school project, Max must design a survey. For his survey he plans to randomly select families and gather information about all the children in each of those families. He must have at least 20 children in his sample. The number of children per family in the U.S. is given in the table below. How many families should Max expect to survey to reach at least 20 children? (treat "5 or more" as 5.)

| No. of Children | 0 | 1 | 2 | 3 | 4 | 5 or more |
|-----------------|----|----|----|----|----|-----------|
| % of families | 17 | 23 | 25 | 16 | 10 | 9 |

5) State your conclusion. 5) _____

6) Explain why the last plan suggested above, selecting the ten trees closest to the parking lot, might be biased. Be sure to name the kind(s) of bias you describe and link it to the variable of interest. 6) _____

7) A statistics teacher wants to know how her students feel about mathematics courses. She decides to administer a survey to a random sample of students taking a mathematics course. She has several sampling plans to choose from. Name the sampling strategy in each. 7) _____

- a. There are four ranks of students taking the class: freshmen, sophomores, juniors, and seniors. Randomly select 15 students from each class rank.
- b. Randomly select ten math class sections and survey every student in each of those sections.
- c. Each student has a nine-digit student number. Randomly choose 60 different nine-digit numbers and survey the students that correspond to those numbers.
- d. Randomly select a number from 1 to 5. Using the class roster, start at that number, then select every fifth student from the list after that.

8) Management at a retail store is concerned about the possibility of drug abuse by people who work there. They decide to check on the extent of the problem by having a random sample of the employees undergo a drug test. Several plans for choosing the sample are proposed. Name the sampling strategy in each. 8) _____

- a. Randomly select ten stores around the country and survey all the employees that work at those stores.
- b. Choose the fourth person that arrives to work for each shift.
- c. There are four employee classifications: supervisors, fulltime clerks, part-time clerks, and maintenance staff. Randomly select ten people from each category.
- d. Each employee has a three-digit identification number. Randomly choose 40 numbers.

9) One administrator suggested walking into the break room and testing the people in there. What type of sampling would this be? Explain why this method is biased. Be sure to name the kind(s) of bias you describe and link it to the variable of interest. 9) _____

10) Name and describe the kind of bias that might be present if the administration decides that instead of subjecting people to random testing they'll just... 10) _____

- a. interview employees about possible drug abuse.
- b. ask people to volunteer to be tested.

Max wants to start a farm to grow mussels. He needs to determine the best environment for growing them. He is going to try two different amounts of salt in the water (salinity) and three different water temperatures. For his experiment he has 18 aquariums, each with 20 mussels. He wants to see which environment produces the largest mussels.

11) Identify the treatments. 11) _____

12) Explain how replication would be used in this study. 12) _____

Researchers plan to investigate a new medication that may reduce blood pressure for individuals with higher than average blood pressure. 90 volunteers with higher than average blood pressure are solicited. Volunteers are randomly assign 100 mg of the medicine, 200 mg of the medicine, or a placebo. Blood pressure will be measured at the beginning and at the conclusion of the study.

13) Identify the treatments. 13) _____

Max wants to start a farm to grow mussels. He needs to determine the best environment for growing them. He is going to try two different amounts of salt in the water (salinity) and three different water temperatures. For his experiment he has 18 aquariums, each with 20 mussels. He wants to see which environment produces the largest mussels.

14) Would it make sense to have a control group that did not get any of the treatments described above? 14) _____

15) Identify the response variable. 15) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 16) It was discovered that a larger proportion of children who slept with nightlights later developed nearsightedness, compared to children who did not sleep with nightlights. The headlines read, "Leaving a light on for you children causes nearsightedness!" Later it was pointed out that nearsighted people have more trouble seeing in the dark and are more likely to leave lights on at night for their kids. And those same nearsighted parents are likely to have nearsighted kids. This is an example of 16) _____
- A) a placebo.
 - B) a control group.
 - C) bias.
 - D) a lurking variable.
 - E) a randomized block design.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 17) Aggressiveness A recent study evaluated elementary age children for aggressiveness. This study found that the children who played video games were more likely to engage in aggressive or violent play at school. The researchers said the difference was statistically significant. 17) _____
- a. Briefly explain what "statistically significant" means in this context.
 - b. The news media reported that this study proved that playing computer games causes children to be aggressive or violent. Briefly explain why this conclusion is not justified.
 - c. But perhaps it is true. We wonder if playing computer games can lead to aggressive or violent behavior in elementary school children. We find 50 young children whose families volunteer to participate in our research. Design an appropriate experiment. (You need not explain how to randomize.)

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 18) A company has tried to improve the effectiveness of its dishwashing detergent and wants to see if it works better than the original formula. They use 6 identical new dishwashers and load them identically with dirty dishes. Three packs of each of the two types of detergent are used, and they are randomly assigned to one of the six dishwashers. After the load is run, they rate each load for overall cleanliness. Which of the following is true? 18) _____
- A) The response variable is the type of detergent.
 - B) Blinding is impossible in this experiment because they must be able to see the dishes.
 - C) A control group with no detergent at all is needed.
 - D) The explanatory variable is the different dishwashers.
 - E) Because each brand is used in three dishwashers, replication is used properly.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 19) Good CDs Brian is a systems manager for a large company. In his work, he has found that about 5% of all CDs he orders are bad. He needs to give one of the executives at his company five good CDs. Conduct a simulation to estimate how many CDs Brian will have to check to get five good CDs for the executive. 19) _____
- a. Describe how you will use a random number table to conduct this simulation.
 - b. Show three trials by clearly labeling the random number table given below. Specify the outcome for each trial.

| Trial | Simulation | Outcome |
|-------|-------------------------|---------|
| #1 | 03242 50692 18977 28370 | |
| #2 | 78695 21402 85525 81183 | |
| #3 | 60809 06765 39996 81915 | |

- c. State your conclusion.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 20) Of the following, which is *not* a critical part of designing a good experiment? 20) _____
- A) All of these are important.
 - B) Control of known sources of variability.
 - C) Random selection of subjects.
 - D) Replication of a sufficient number of subjects.
 - E) Random assignment of subjects to treatments.